

Application No.: 09/800,550  
Amendment Dated March 1, 2005  
Reply to Office Action of December 1, 2004

SAR 13825

**Remarks/Arguments:****Information Disclosure Statements**

Applicants appreciate the Examiner's acknowledgement of the IDS of September 25, 2002. Applicants have not received the Examiner's acknowledgement of the IDS submitted on February 5, 2002, however. Therefore, Applicants respectfully request that the Examiner review and acknowledge the IDS of February 5, 2002.

**Pending claims**

Claims 1-11, 15-26, 41 and 42 are pending in the above identified application. Applicants appreciate the Examiner's statement that claims 7-11 and 19-26 include allowable subject matter.

**Rejections under 35 U.S.C. § 112, first paragraph**

Claims 1, 10, 15, 41 and 42 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Claims 1, 10, 15, 41 and 42 have been amended to remove reference to "fiducial marks" and to expand the description of the relevant features of the three dimensional model. Support for the expanded description of the relevant features included in claims 1, 10, 15, 41 and 42, as amended, is found in paragraph [0034] of the Specification.

Therefore, Applicants respectfully submit that claims 1, 10, 15, 41 and 42, as amended, are no longer subject to rejection under 35 U.S.C. § 112, first paragraph.

**Rejections under 35 U.S.C. § 102**

Claims 1-6, 15, 16, 41 and 42 have been rejected under 35 U.S.C. § 102 (e) as being anticipated by Sundareswaran et al. (U.S. Patent No. 6,330,356)

Reconsideration is respectfully requested.

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### Claim 1

Claim 1 is directed to a method for accurately estimating a pose of a camera within a scene using a three dimension model of the scene that may be distinguished from the visual registration method of Sundareswaran et al. In particular, Sundareswaran et al. do not disclose or suggest at least one feature recited in claim 1, namely:

...b) selecting a set of relevant features of the three dimensional model based on the initial estimate of the pose, the relevant features representing discontinuities in at least one of a surface normal or material properties in the scene;...

...d) matching a plurality of features of an image received from the camera to the virtual projection of the set of relevant features;...  
(Emphasis added).

That is the present invention recited in claim 1 uses relevant features that represent discontinuities of the scene caused by changes such as surface normals or material properties in the scene itself. Thus, present invention recited in claim 1 does not use artificially added features (e.g. the fiducial markers) to match the image to the three dimensional model of the scene but, instead, optimizes the fit between line segments in the virtual image to gradients of image intensity in the actual image. (See the present specification, for example, at paragraphs [0034]-[0038].)

### Sundareswaran et al. Reference

Sundareswaran et al. discloses a dynamic visual registration of a 3-D object with a graphical model in which visible fiducial markers are used, and:

... placed on the viewed object in locations with known correspondence to the CAD model of the object. To facilitate registration, the fiducial markers should be clearly detectable even in a cluttered environment, clearly distinguishable from each other, [and] uniquely identifiable. Most preferably, they should have these characteristics even when viewed from a wide range of angles. (Brackets added; see Sundareswaran et al. at column 7, lines 17-26).

This means that, contrary to the present invention recited in claim 1, in the Sundareswaran et al. method, the use of corresponding fiducial markers is required in the real and virtual images so as to match positions and orientations of these markers to update estimates of camera pose.

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With regard to claim 1, the rejection is overcome by the amendment to claim 1.

**Claims 2-6, 15, 16 and 41-42**

With regard to claims 15 and 41-42, the rejection is overcome by the amendments thereto for similar reasons to those of claim 1, as well as for the addition features recited therein.

Claims 2-6 and 16 includes all the features of their respective base claims 1 and 15 from which they depend. Thus, claims 2-6 and 16 are not subject to rejection under 35 U.S.C. § 102(e) as being anticipated by Sundareswaran et al. for the reasons set forth above concerning the rejection of claim 1.

Claims 17 and 18 were rejected under 35 U.S.C. § 102 (b) as being anticipated by Cox et al. (U.S. Patent No. 5,644,651)

Applicants respectfully traverse this rejection and requests reconsideration.

**Claims 17 and 18**

With regard to claim 17, the Examiner contends that Cox discloses "comparing the image to the three dimension (column 1, lines 8-12) model of the scene to generate an estimate of the pose (column 2, lines 24-53, column 4, lines 53-60)."

Applicants respectfully disagree with this analysis as it pertains to the subject application.

**Cox et al. Reference**

Cox et al. is directed to a method of determining the rotation and translation of a camera by comparing successive frames, or, alternately, developing a 3D representation of a scene using the successive frames. Cox et al. do not disclose or suggest the use of a three-dimensional model in either of these calculations. More particularly, "FIG. 4 [of Cox et al.] is a flow chart of the process for determining the unknown amount of rotation between two frames of a scene taken either by two cameras that are spaced apart or one camera that has been moved to record the two frames ... Once the amount of rotation is known, this can be used in known fashion in conjunction with the two frames of the scene to construct a quite accurate

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three dimensional representation of the scene." (See Cox et al. at column 5, lines 7-42, and more particularly column 5, lines 7-10 and 38-42.)

In contrast to the present invention recited in claim 17, in the Cox et al. disclosure, since the three dimensional representation of the scene is a result of processing (i.e., a comparison of successive frames), the three-dimensional representation of the scene can not be used to select "a set of relevant features of the three dimensional model based on the estimate of the pose" or to match "a plurality of features of the image to the set of relevant features and measuring a plurality of matching errors" as required by claim 17.

Accordingly, claim 17 is not subject to rejection as being anticipated by Cox et al.

Claim 18 includes all the features of claim 17 from which it depends. Thus, claim 18 is not subject to rejection under 35 U.S.C. § 102(b) as being anticipated by Cox et al. for the reasons set forth above concerning the rejection of claim 17.

### Conclusion

In view of the foregoing amendments and remarks, Applicants request that the Examiner reconsider and withdraw the rejection of claims 1-6, 15-18 and 41-42.

Respectfully submitted,



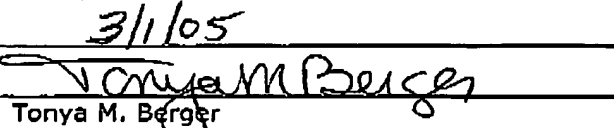
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